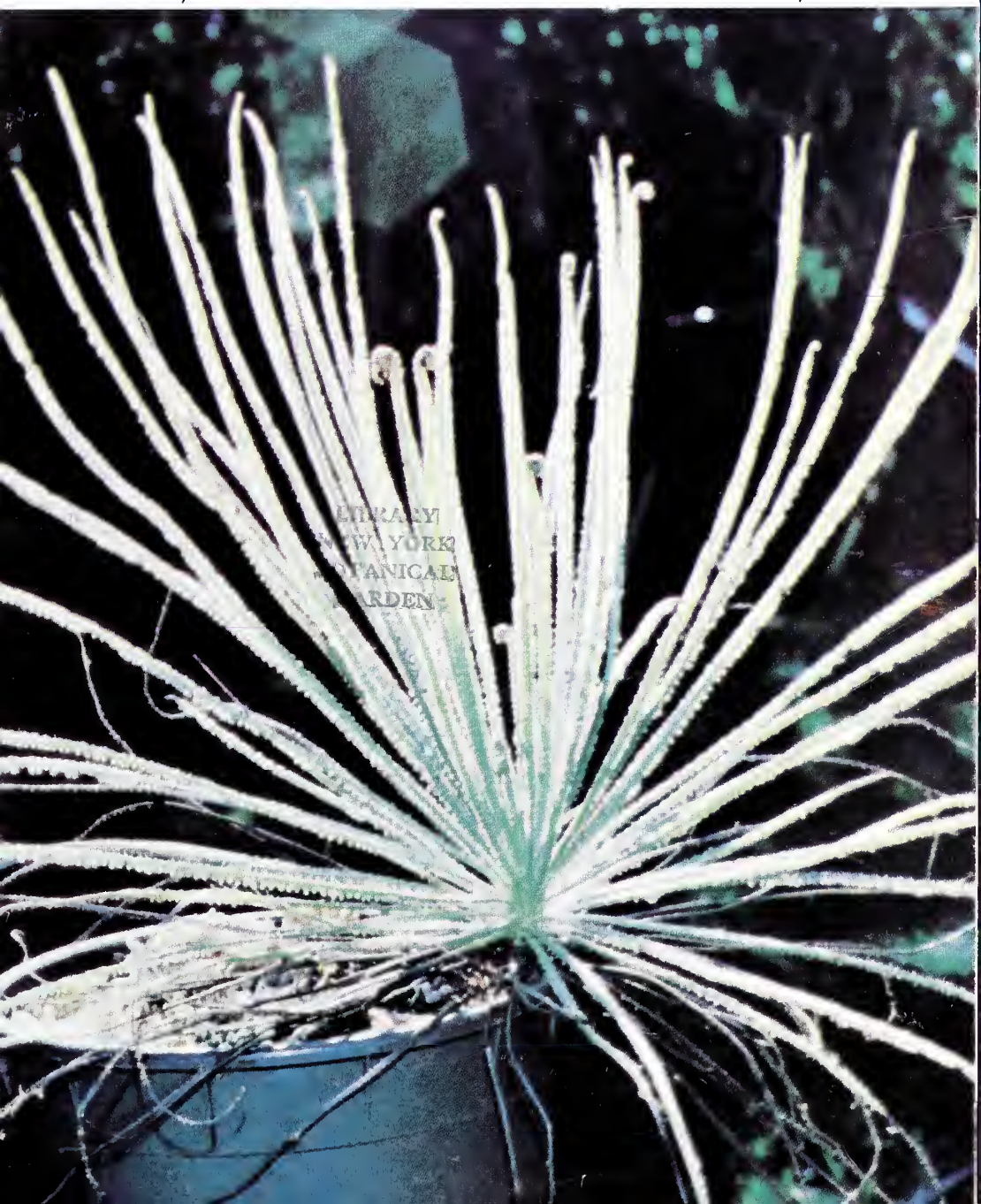
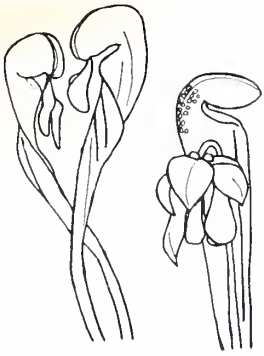
CARNIVOROUS PLANT NEWSLETTER

VOLUME 7, Number 4 DECEMBER, 1978





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Cover

Drosophyllum lusitanicum is at the most a short-lived perennial with abundant one inch sulphur yellow flowers. This plant grown by J. A. Mazrimas is in a one gallon container which is about 6 inches/ca 15 cm. in diameter. All attempts to propagate the plant other than from seed have generally failed.

Photo by J. A. Mazrimas

SPECIAL NOTICE

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your subscription to CPN:

All correspondence regarding subscriptions, address changes and missing issues should be sent to Pat Hansen, c/o The Fullerton Arboretum, Dept. of Biology, California State University, Fullerton, CA 92634. DO NOT SEND TO THE CO-EDITORS. Checks for subscriptions and reprints should be made payable to CSUF FOUNDATION — ARBORETUM.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others. Comments on the new format will be greatly appreciated.

Names and addresses of the publisher and the co-editors will be found inside the front cover of each issue.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

Copy deadline for the March issue is February 1, 1979.

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Editor's Corner

Our first year on the new format has been one filled with many accomplishments. We hope to continue with many more new ideas for the coming year.

Several things are being planned for Volume 8. The March issue will feature *Nepenthes* with many articles now being reviewed. Each issue next year will feature a particular group of CP. Further details will be announced next year. However, the March, 1979, issue will be the *Nepenthes* issue. For this reason, the Botanist's Corner, which is on the history of *Nepenthes,* will be delayed until the March issue, where it will be more appropriate.

We are in the process of working out the details of the *Nepenthes* cuttings distribution project; it is hoped that final details will be available by the time the March issue goes to press. Requests (which must include payment for packaging and postage) will be accumulated and orders will be sent out on a specific date to insure freshness of the material. Please do not send any requests until after the March issue.

A reminder — please remember that subscriptions are accepted on a calendar year basis only, with multiple subscriptions for up to three years. Rates remain unchanged from last year, which is good news in these inflationary times.

The editors and staff wish to take this opportunity to thank all subscribers and contributors who have helped make this our best year ever. May you all have a happy holiday season and a joyous and prosperous New Year.

DON'T FORGET!
RENEW IN TIME FOR 1979!

Seed Bank

Patrick Dwyer (St. Michael's Episcopal Church Gardens and Arboretum, 49 Killean Park, Albany, NY 12205) has answered 266 letters (mostly seed orders) since January. Seed has been donated by 54 people (see listing below), and the Seed Bank has contributed $865.67 to CPN. Many thanks to Patrick and all CPNers who have participated in this program. For instructions on ordering and sending seed, see CPN 7(1):3-5.

SEED BANK DONORS

J. Mazrimas (744), B. Hanrahan (605), J. Miller (421), R. Gardner (349), C. Bramblett (265), D. Schnell (228), J. Brodie (194), P. Thomas (140), O. Tallman (132), R. Frenzer (120), G. Ashley (118), S. Clemesha (112), G. Nolan (105), S. Plamondon (98), S. Jackson (91), P. Dwyer (80), S. Olejnik (78), L. Song (60), L. Mellichamp (48), S. Thomas (48), P. Taverna (45), W. Greenwood (34), B. Muller (34), R. Riedl (34), C. Palmer (33), B. Augustine (32), S. Rehder (32), D. Burden (30), J. Korolas (30), J. Pietropaulo (30), A. Omori (26), J. Kwan (24), J. Watkins (23), R. Fleming (20), M. Levy (20), P. McLaughlin (20), D. Butler (18), M. Depaz (17), D. Taylor (16), R. Chapman (12), R. Phillips (12), B. Dudley (10), D. Graber (10), A. Magnus (10), R. Tilbrooke (10), J. Van Dyke (7), A. Bendorf (6), S. Richardson (6), R. Spores (5), A. Griesser (2), S. Henderson (2), M. Leidig (2), S. Segal (2), P. Ware (2)

SEED BANK INVENTORY
October 20, 1978
Cost $.50 per packet
(Number of packets is listed if less than 15)

Byblis liniflora; Darlingtonia californica; Dionaea muscipula; Drosera aliciae 4, *D. anglica, D. auriculata, D. burkeana, D. burmannii, D.* x *californica* 4, *D. capensis, D. capensis* (reg. and narrow mixed), *D. capensis* (narrow), *D. capensis* (narrow) & *D. capillaris* (long) mix 3, *D. capillaris, D. capillaris* (Gulf Coast giant) 11, *D. capillaris* (long leaf), *D. capillaris* (white flower) 12, *D. capillaris* (mixed types), *D. filiformis filiformis, D. filiformis tracyi* 2, *D. indica* (red flower), *D. indica* (white flower) 1, *D. intermedia, D. linearis* 2, *D. macrantha, D. montana* 13, *D. natalensis* 3, *D. peltata, D. planchonii* 6, D. *rotundifolia, D. spathulata, D. spath.* (Australian), *D. spath.* (Kansai), *D. spath* (Kanto) 2, *D. spath* (white flower) 10, *D. whittakeri* 10, *D.* sp. 3; *Nepenthes khasiana, N.* x *chelsonii* x *N. coccinea, N.* x *chelsonii* x *N. rafflesiana*-Singapore, *N.* x *chelsonii* x *N.* x *williamsii, N.* x *intermedia* x *N. rafflesiana*-Singapore, *N.* x *morganii* x *N. williamsii, N. rafflesiana* (vitata) x *N. rafflesiana*-Singapore; *Pinguicula grandiflora* 6, *P. macroceras* or *vulgaris* (Alaska); *Sarracenia alata* 2, *S. alata* (x-ray, 100 rads) 15, *S. alata* (x-ray, 550 rads) 5, *S. flava, S. leucophylla, S. minor, S. oreophila* 10, *S. psittacina, S. purpurea, S. purpurea purpurea, S. purpurea venosa, S. purpurea venosa* (pink flower), *S. rubra* (Gulf) 10, *S. rubra alabamensis* 2, *S. rubra jonesii, S. alata* x *flava* (copper) 2, *S. alata* x *leuco., S. alata* (purple) x *leuco.* (green vein) 3, *S.* x *harperi* 8, *S. leuco.* x *purpurea* 5, *S. leuco.* (dark) x *purpurea venosa* 1, *S. leuco.* x *rubra* 1, *S. leuco.* (dark) x *wrigleyana* 5, *S. psitt.* x *minor* 1, *S. psitt.* x *rubra* 1, *S. psitt.* x *rubra* or *leuco.* 2, *Sarracenia* mix, *Sarracenia* hybrid mix 3; *Utricularia longifolia* 3, *U. subulata* 4

Round Robin Letter Exchange

by Terry Brokenbro
(37 Laburnham Gardens, Upminster, Essex, U.K.)

Another popular Round Robin is the General one. Certainly from the descriptions that many growers give on C.P. under lights, it would seem 'their houses must be more like glasshouses than homes — such dedication!

On the subject of overwintering C.P., Philip Thomas reports success with *Sarracenia* and *Drosera* even with an average winter temperature of 25°F (-4°C) in Weaverville, N.C.

Joe Mazrimas, on the other hand, has problems with warm winters in keeping cool C.P. such as *Drosera rotundifolia* although the conditions are right for *D. capillaris*. Personally, the latter species is almost impossible to grow in the U.K. with our cold and very humid winters. The opposite is true for *D. rotundifolia* and sometimes it grows and seeds like a weed (albeit a pleasant one). Whether one wishes to use artificial or natural methods for winter dormancy depends on personal experience. Timothy Mulkey (Springdale, Ak.) tends to use artificial means while Joe Mazrimas uses natural conditions for most species.

There is some debate over *Drosera* x *nagamoto* and whether it can withstand hard frost or not. This unique plant inherits certain characteristics from its parents (*D. anglica* x *D. spathulata*-Kansai), and I feel it could easily withstand a hard winter. At the present time, I am experimenting with a few spare plants outside to prove this point. If any CPNers have spare plants to help in this experiment or someone has already tried this, I would like to know.

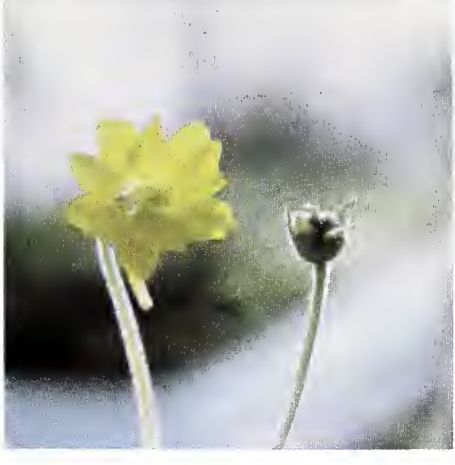
News and Views

ROBERT ALLEN (6117 Rockrose Dr., Newark, CA 94560). To germinate seed of CP, I use the following technique: I fill a small 6-compartment plastic container (which bedding plants come in) with wet sphagnum. After sowing the seed, and rewetting the moss, the container is then sealed in a plastic bag and placed under a bank of four foot fluorescent lights with "Vita-lites". The container is placed about one inch under the lights. After germination, a small tent must be made to accommodate the growing seedlings. I have used this method successfully with *Drosera, Byblis liniflora* and *Drosophyllum. Drosophyllum* seeds need soaking in hot water and allowing them to cool overnight. For *Nepenthes* seed, I will place the tray over the ballast on the light fixture which provides bottom heat, but I don't yet know how it will work.

A good planting mix for *Darlingtonia* that I use is made up of a 50-50 mixture of peat moss and sand, mixed with pea gravel so that the final mixture is 75% pea gravel and 25% sandy peat. This mixture is placed into a clay pot with the plant, and I flood this once a day. The pea gravel stays cool, and the sandy peat fills in the spaces which allows the roots and stolons to grow easily. The pot stands in water also. I give the *Darlingtonia* morning sun in my greenhouse and temperature rises to at least 80°F but the afternoon shade cools it down. My plants have a beautiful reddish color on the forked tongue and hood and show no signs of drying out under these conditions.

BILL CARROLL (Botany Dept., Carolina Biological Supply, Burlington, NC 27215) sends along the following method he has developed for raising *Pinguicula lutea* from seed. The soil mix is two parts brown fibrous peat moss and one part vermiculite. For sowing seeds, this mix is moistened using one-fourth teaspoon of Mir-Acid (obtainable in garden supply stores) per quart of water. When transplanting, up to one-half teaspoonful of

P. lutea ready for sale
Photo by Bill Carroll



P. lutea flower & fruit
Photo by Bill Carroll

Mir-Acid may be used per quart. Seedlings are potted up in plastic "cell paks" 36 per flat, the flats being leakproof plastic. He fills the flats half full of water and refills only when empty of water but before the soil mix dries out. Water is piped to the greenhouse from a spring. He has found that Mir-Acid at the above rates of dilution does wonders for sundews, flytraps and pitcher plants as well as *P. lutea.*

MIKE GODDARD (90 S. Yates, Denver, CO 80219) writes that a lot of progress has recently been made towards setting up a CP display at the Denver Botanic Gardens. Andrew Pierce, director of the conservatory and greenhouses, feels it could be a very nice addition, but donations of plants, rhizomes and seeds are needed. Funds for this project are limited. Please send donations to Mike. (This is volunteer work, and there is currently no one employed to handle incoming plants properly.)

CPN readers will recall that in CPN 6:33, JIM KOROLAS (36 Eastlea Cres., Agincourt, Ontario M1T 3A6 Canada) reported a new Ontario location for *Sarracenia purpurea* f. *heterophylla.* While looking through the University of Toronto Herbarium, he found a specimen of f. *heterophylla* from a bog somewhat more east of his location. The sheet was 40 years old and he has not yet tried to refind the location. He also found two other *S. purpurea* variants, these having bright yellow or yellow green leaves with prominent venation as seen in open sunlight and shade. He is considering the possibility of these being a hybrid with f. *heterophylla* although the latter is not currently present in this particular bog.

STEPHEN LAMINACK (P.O. Box 80203, Denver, CO 80203) writes: I'm interested in publishing some note cards, post cards, or maybe calendars (1980) on the subject of carnivorous plants. I need to know what kind of interest fellow CPN subscribers would have in such an item; tell me your ideas and the number of cards or notes you might order. If you have color transparencies or art work, let me hear about it (but don't send anything yet).

PAUL MC MILLAN (2155 Old Patagonia Road, Nogales, AZ 85621) writes: There is a very interesting Cretaceous relict bog on acidic sandstone on state game lands in southwestern Pennsylvania about 50 miles from where I was born and once lived. This bog was interpreted as having survived from the Cretaceous more or less unchanged which would be many millions of years. It is fortunately remote and very difficult to find and is, among other things, the habitat of the rare bog orchid, *Arethusa bulbosa.* This is the only colony of *Arethusa* known to survive in western Pennsylvania any longer. The bog is on the Chestnut Ridge of Fayette Co., Pa. east of Uniontown and lies in a solid sandstone saucer which was lifted up intact from old Schooley peneplain surface as successive mountain uplifts of the Appalachians occurred. This underlying layer of hard, resistant sandstone prevented its drainage and it harbors various typically coastal plain species such as the Bog Milkwort (*Polygala cruciata*) and it also contains *Drosera rotundifolia.* This bog is very warm and the layer of sphagnum growing over the sandstone is comparatively very thin; usually only 4 to 6 inches deep. A small, clear sandy brook flows slowly through the center and the white and pink underlying sandstone shows thru in many places. It is an exquisite place and, I think, very safe since it is on protected Pennsylvania state game land. What I think has maintained this particular bog for such an enormously long time is the thinness of this sphagnum layer kept permanently moist by the seepage of springs and brooks down the sides of the

solid slopes above the bog. The thinness of the peat layer creates an unusually sterile habitat and very poor footing for any trees or shrubs that try to encroach on the habitat and the summer warmness encourages rapid bacterial decompositional action which doesn't allow the peat layer to accumulate to any extent. The constantly seeping oxygenated water and the shallowness of the peat layer allow for unusually good aeration apparently allowing good aerobic as well as anaerobic bacterial activity causing the peat to decompose rapidly and preventing its gradual layering and accumulation. The soil of the whole surrounding region is intensely acid and harbors large pink ladyslipper colonies. Thus local conditions here seem to effectively prevent eutrophication and progression toward climax forest.

JOE MAZRIMAS would like to report on a new nursery in Australia that now is selling native Australian CP and various *Nepenthes* species. This nursery will sell *Cephalotus, Drosera, Byblis* and *Nepenthes mirabilis* and *Nepenthes* species from Asia and Borneo. The owner stated that the plants are field collected and 90% of these are from fields due to be ploughed by the farmers in the area. When a large mother stock is built up, the owner will propagate these plants in the future. For a catalogue, write to: Exotic and Bizarre Plant Nursery, Blue Plain Rd., Chittering, 6084, West Australia.

In the September, 1978, issue of CPN (p. 78), we invited anyone who had success with leaf propagation of *Sarracenia* to contact us. BILL SCHOLL (11420 Winterpock Rd., Chesterfield, VA 23832) wrote us of his success. He removes smaller, immature leaves of *S. purpurea,* including the clasping petiole, from the parent plant and dips the petiole end in Rootone. This is then potted in sphagnum and roots begin to appear in 3-4 weeks. As we would anticipate, peeling off the clasping petiolar base and juvenility seem to be key factors.

Bill has also tried leaf cuttings of *Cephalotus* where it is difficult to get the base of the petiole. All eventually rooted, but those with the base rooted two weeks earlier.

At the recent San Francisco Flower and Garden show held August 26-27, nine people from the Bay Area entered plants for judging and showing. Anthony Rea did an excellent job of setting up the spooky staging for the plants including a lighted sign and a human skull! Those who entered plants were: Raymond Triplitt, Kathryn and Glenn Kingston, Byron Aarstad, Louise Avila, Allen Posey, Joe Mazrimas, Robert Allen and Allen Ber. Everyone seemed to win a prize or two for their plants and Joe took the honors with a beautiful 3-foot ribbon for the best of show with a *Cephalotus* plant.

MARY SCOTT (702 Lansdowne Ave., Toronto, Ontario, Canada M6H 3Y8) has *Dionaea* T-shirts for sale: Two color, silk screened, washproof colors on all cotton T-shirts. Drawing, scientific name, and inscription "Take a flytrap to lunch." Order shirt style G (*Dionaea*), sizes small, medium and large. Cost: $7.00 each (Ontario residents add 7% sales tax).

STEVE SMITH (RD #1, Box 296, Kirkwood, NY 13795) has a long article written about him and his CP. It appeared in 6 big pages of a Sunday newspaper supplement from Binghamton, NY, on Sept. 3rd. A full page color photo of Steve and his plants appears on the magazine cover. Additional photos appear (some good sharp closeups) in the article inside. The writer, Keith George, "did a pretty good job considering he knew absolutely nothing about plants, much less CP," says Steve.

TOM STORY (1112 Klengel Street, Antioch, CA 94509) writes: I recently ordered and received some bladderworts from WIP and would like to tell you

about something I tried. Not having any apparent success with the microworm culture they sell I added 1 oz. each to the 10 gallon aquarium of fish emulsion and seaweed solution. To my surprise in a few days countless little wigglies began to appear and thrive. Besides being fascinating to watch, they seem to be about the right size for the bladderworts to eat. I have not yet isolated the starter solution between fish emulsion and seaweed solution, nor have I yet actually observed the bladderworts consuming these entities, but it seems to me that it bears further experimentation by myself and anyone else interested. I do not know yet what theese organisms are, but my uneducated guess is that they are a miniature form of shrimp. They are about the size of a (.). Along with the bladderworts I seem to have inadvertently provided a home for about 30 larval mosquitoes and some larval ? !

I, as many other growers who have limited space, grow my CP in long fiber sphagnum moss in 10 gallon terrariums. It being very difficult to gauge the water content inside, I slit an ordinary plastic straw lengthwise and insert it against the glass at the bottom so that the upper water limit is easily gauged. Of course, this still doesn't answer the question of what the proper level is, but at least it provides a point of reference. Perhaps sometime in the beginners section instead of the usual "don't overwater" you could use this method and say "keep at ½" of water" or whatever is correct.

DAVID TAYLOR (The Everglades, 76, Crossland Ave., Norwood Green, Southall, Middlesex UB2 5RA, ENGLAND) writes to Joe Mazrimas: I have some great news for you, Joe. You already know about the formation of a plant society in this country. Some time ago, young John Watkins suggested to me that we exhibit a show of plants at the forthcoming Royal Horticultural Society annual show in London. The sole idea was to gain membership for the new CP society. There were four of us founder members who donated plants for the event. The show was held during this past week, and our exhibit was very impressive. John was bubbling over with excitement when he telephoned me to say that we had been awarded the RHS silver medal for our exhibit. There were only a few points separating us from the first position and the gold medal. This was all very unexpected, for to win something at a RHS show is a very high honour. There was a good write-up in some of the national papers the following day, and John had his photograph taken for the gardening magazines.

JOHN WATKINS (98 Earl's Court Rd., London W86EG, ENGLAND) wrote to say that he and Mr. Mackie recently entered CP in the Royal Horticultural Society's summer show, where they attracted a lot of public interest as well as press. They also won a Silver Lindley Medal of which they are justly proud. Good growing, Fellas!

SPECIAL NOTICE

We note from past issues of CPN that many local Carnivorous Plant Clubs are forming in many places in the world. As a special service to our readers, we would like to make a complete listing of these in a forthcoming issue of CPN. Therefore, we are asking the executive officer of each club to send us the following information: Club name, location, name and address of person to contact for membership, phone number, copy of information sheets (if any), meeting times and places, any publication of the club, dues.

We would like to obtain this information as soon as possible so it may be included in complete form in the March, 1979, issue of CPN.

PARKER WEBB (302 Stayman Dr., Ranson, WV 25438) writes: There is a way to stratify *Sarracenia* seeds that I think CPN readers might want to know about. First, you find an old pill or coin bottle and label it with the name of the seeds you are going to put in it. Then you take a piece of paper towel and moisten it. Place the seeds on the towel and put them in the bottle. Keep this in the refrigerator for about two months.

This is my first volume of CPN, and I would like to say it is great! I plan to subscribe next year, too. Also, I would like some information from CPN readers on the whereabouts of bogs in the northern Virginia area.

QUESTION AND ANSWER DEPT.

Q. Is it alright to transplant non-native CP into local bogs in my area? (E. T., Kaneohe, HI 96744)

A. In 99% of the cases, I would say NO. Look what happened several times in the past: plants have been established, nobody knew about it, or remembers it, no notes were published. Fifty years later someone discovers the plants in a possible habitat, and we have to wonder whether they are native or not (e.g., the note on *Drosera* in Florida). Even worse, non-native plants could hybridize with native stuff and ruin a pure gene pool, e.g., Gulf plants transplanted into the Green Swamp of N.C. This is VERY BAD practice. On the other hand, growing rare plants such as *S. jonesii* in culture from wild seed for the purpose of re-establishing populations in the wild in suitable places within the plant's native range may be a viable conservation practice. Of course, only highly knowledgeable people (those who are 100% sure of native habitats, purity of wild seeds, etc.) should do that.

Transplanting non-natives is one experiment for testing hardiness or adaptiveness of plants; but this should be done under controlled conditions and should be documented. If you own a bog in California and want to grow *Sarracenia,* I feel that it would then be all right to grow them as in a garden situation, since no one could ever mistake such a find for *Sarracenia* native in the West! So, there are several categories of situations: (1) specific location, (2) types of plants, (3) reasons.

In summary, all else being equal, I'd say transplant non-natives far, far from their native ranges ONLY.

Q. Where do the carnivorous seeds of *Capsella bursa-pastoris* fit on the evolutionary tree diagrammed in CPN 7(1):18? (J. B., Ontario, CA)

A. *Capsella* is a mustard and thus would go just above the Sarraceniales along with the "cabbage and mustards." I find that situation remarkable that the seeds fulfill all the criteria for carnivory. This could act to deter predators, but the article was right in mentioning that seeds generally do not need food supplements, although there's nothing wrong with having extra nutrition in the vicinity for the young seedling (nutrition it gets on its own). It will take more observations, I think, to come nearer to elucidating the "reason" for the apparent carnivory as we define it.

Beginner's Corner

ALDROVANDA

by Joe Mazrimas

Active trapping mechanisms in the flowering carnivores are present in two genera, *Dionaea* and *Aldrovanda.* Although the former plant is mainly a terrestrial form, the latter plant floats on the surface of tropical and temperate zone waters, especially acidic water. A comparison of some properties in these two plants reveals that *Dionaea* has 6-8 sensory hairs on the trap lobes while *Aldrovanda* has 30-40 sensitive hairs on the upper surface of the trap lobes. At moderate temperatures, it takes 2 stimuli, either mechanical or electrical, at an interval less than 20 seconds for complete closure of the *Dionaea* trap to take place. In *Aldrovanda,* if the hair is bent twice, the trap will close; it's not known what the minimum interval is. The traps of both genera can be stimulated to shut even when the lobes are scratched or pricked with a needle. The cells of *Aldrovanda* in the motor zone in the central part of the trap are very sensitive to mechanical stimuli. One can even stimulate the traps to close by immersing electrodes in water and giving the floating plant an electrical shock.

At very high temperatures about 95-105°F (40°C), *Dionaea* needs only one stimulus on the trigger hair to cause the trap lobes to close. A sudden rise or fall in water temperature results in the traps of *Aldrovanda* to close but it takes much longer for the effect to take place — 2-50 secs vs. 0.1 sec in *Dionaea.*

One gets the impression when looking at a mass of *Aldrovanda* from a short distance, that they resemble tiny green bottlebrushes floating just under the smooth surface of the orange-brown clear water. A closer look reveals that the leaves are arranged in whorls separated by short segments of stem. There are usually 6-8 leaves arranged like spokes of a bicycle wheel around the stem with the flytrap-like traps found on the tips of the leaves. However, the largest trap I've seen was no bigger than 3/16ths of an inch (5 mm.) but its sensitivity and trapping ability is astonishing. I noticed that some of the bristles connected to the trap actually break the surface of the water and stick straight up into the air about 1/16th of an inch (2 mm.) but I don't know what purpose these bristles serve. For the five years that I was growing this genus of plants, I experimented and found a simple system to grow this plant requiring a few essentials.

The container is a plastic dishpan about 8 in. (20 cm.) deep and 20 inches (50 cm.) in diameter. First, I bring to a boil a large kettle of water (I use tap water) and slowly pour into it sufficient Canadian peat moss so that it will fill the bottom of the dishpan to a depth of two inches (5 cm.). Bring the mixture to a boil again and let simmer for 30 minutes. After it cools, pour the entire kettle into the dishpan and after 4-6 days the peat finally settles so that the water is clear and yellowish in color. This water is acid and is sufficient for growing *Aldrovanda.*

Aldrovanda grows best in partial sunlight since you don't want any competition with algae growing in the same container. Algae prefers strong light and so it's best to grow in bright shade for most

of the day. The temperature of the water should be 70-75°F (23°C). If the temperature is lower the growth is slower and at temperatures below 60°F (16°C) growth practically ceases. At lower temperatures the plant will attempt to go dormant. I don't give my plants any dormancy period since that is rather tricky and you may lose the plants trying to do so.

Also, I don't make any attempt to feed the plants since the water contains tiny organisms and tiny animals for the plants to feed on. You can feed the plants brine shrimp, daphnia or vinegar eels. Don't overfeed the plants since this fouls the water.

Healthy *Aldrovanda* plants have an onion-shaped growing tip and should produce at least one to two whorls per day. If your plants look sick and are not growing well, then change ⅔rds of the water with fresh water by carefully pouring off the old water and replacing it with fresh water. The surface of your artificial pond should be crystal clear and to make it so, swipe the surface with newspaper by dragging sheets of newspaper over the surface which removes both surface algae and grease and oils that contaminate the surface. Remember that the water should always be acid. Although in nature the plants grow in water at a pH of 6.5 or so, in cultivation they seem to like to grow in pHs of 4.5 to 5.5 since these pH values are easy to maintain with the above system that I described.

To propagate *Aldrovanda* is simple—just cut the stems at intervals containing 3 whorls or more. In a few weeks time, a new growing shoot will start from the whorl axil and grow into a new plant.

Although my plants have never flowered in cultivation, its interesting that the white petaled flower is related to *Dionaea* which is not too surprising because of the similarities mentioned in function described in the beginning of this essay.

Sibakoa, Takao in Annual Review of Plant Physiology. 20:165-184, 1967.

Review of Recent Literature

Adams, Richard II. 1978. Plant parenthood and the single cell. Horticulture 56(10):16-22.

While not dealing solely with CP, this excellent review article on the process of "meristemming" or "shoot tip culture" certainly has potential application for us. There is an inspiring full page color plate of some young *Cephalotus* "budlings" in an agar culture tube, and many other line drawings to illustrate the principles of this process.

Dexheimer, J. Study of mucilage secretion by the cells of the digestive glands of *Drosera capensis* L. using staining of the plasmalemma and mucilage by phosphotungstic acid. Cytologica (Tokyo) 43(1):45-52. 1978.

Phosphotungstic acid makes it possible to contrast the membranes and mucilage secreted by the digestive glands of the *Drosera* species under study.

Fish, D., Hall, D. W. Succession and stratification of aquatic insects inhabiting the leaves of the insectivorous pitcher plant, *Sarracenia purpurea.* Am. Midl. Nat. 99(1):172-183. 1978.

Three types of insects that inhabit the pitcher fluid of the above plant do so at different times and at different strata as they feed upon the dead insect remains. The buoyant larvae of *Blaesoxipha fletcheri,* of the fly family, feed up-

on newly captured insects floating on the surface. Free-swimming *Wyeomia smithii* (mosquito larvae) feed upon the suspended particulate insect remains drooping down from the surface and finally, *Metriocnemus knabi* (midge larvae) feed upon the bottom of the leaf chamber.

Johnson, Peter H. 1978. Venus's-flytrap. House Plants and Porch Gardens 3:60-63.
A popular article on *Dionaea* emphasizing horticultural aspects. Three color photos and source list.

Kondo, Katsuhiko and M. Segawa and K. Nehira. 1978. Anatomical studies on seeds and seedlings of some *Utricularia* (Lentibulariceae). Brittonia 30:89-95.
There has been much confusion regarding naming of various *Utricularia* vegetative parts, all of which seem diverse and multipotential. These first detailed anatomical seed and seedling studies also raise unresolved problems. There appears to be fairly consistent developmental diversity between aquatic and terrestrial species, especially regarding presence of cotyledons which these "dicot" plants do not always have.

Larochelle, A. The insectivorous plants of the genus *Drosera* L. as predators of *Odonata* (dragonflies). Cordulia 3 (4):136-138. 1977.
The author observed in a few hours in June 1977 in a southern Quebec, Canadian bog that *D. rotundifolia* trapped 96 dragonflies belonging to 9 species. Most of the specimens caught were the small sized males.

Romeo, John T. and John D. Bacon, Tom J. Mabry. 1977. Ecological considerations of amino acids and flavanoids in *Sarracenia* species. Biochemical Systematics and Ecology 5:117-120.
Leaf extracts of cultivated samples of plants were analyzed by two-dimensional paper chromatography, high voltage electrophoresis and gas chromatography for amino acids, alkaloids and volatile amines. Only common amino acids were detected, and there were no alkaloids or volatile amines; cf. other references quoted by the authors. Flavanoid complements were remarkably similar with only one or two varying somewhat among the taxa. Characteristic patterns of flavanoids for each of the taxa were not observed with leaf extracts, these techniques, and limited samples pooled and examined.

Schnell, D. E. 1978. *Sarracenia* L. petal extract chromatography. Castanea 43: 107-115.
Two-dimensional thin-layer chromatographic studies were done on petal extracts of all species of *Sarracenia,* including many infra-specific variants for a total of 24 taxa. Comparisons are made with a previous report of paper chromatograph studies of dry pitcher hoods, and there is a discussion of the relative value of the procedure in this genus along with observations on the results. It is noted that red-flowered species do indeed have underlying yellow and sometimes blue pigments which would presumably be visible to bee pollinators (red is generally held not to be visible to bees). (Reprints: DE Schnell, Rt. 4, Box 275B, Statesville, NC 28677).

WANT ADS

Mark Maloof, 5 Gerard Drive, Merrimack, NH 03054. (WB) any Nepenthes plants, cuttings (with the exception of N. khasiana), N. rafflesiana and N. maxima plants and cuttings.

Chris Tate, 779 Elaine St., Pomona, CA 91767. (WTS) Plants or seeds of Cephalotus, Heliamphora nutans, Nepenthes rafflesiana.

Tucker, Gordon C. 1978. Notes on the flora of Rhode Island. Rhodera 80: 596-597.

Among several other plant species, the author reports *Drosera filiformis* as a new record for the state, located near South Kingstown. There were six vigorous plants with about 50 seedlings in a gravel bank along the edge of a pond. (Ed. note — The finding of six plants along a pond margin in a state with no previous reports causes one to wonder: What if the six mature individuals were transplanted there by someone unknown to the author, and the 50 seedlings are the progeny of these plants? It is peculiar there are not more and that there were mature adults and very small seedlings only with no intermediates.)

Short Notes

Some Thoughts And Observations on *Sarracenia*

by Paul McMillan
(2155 Old Patagonia Rd., Nogales, AZ 85621)

In regard to Sarracenias, I feel strongly that the large Gulf coastal plain form of *S. flava* which is larger and more robust than that on the Atlantic coastal plain should be given *varietal* status as *S. flava* variety *Rugelii* as it was described in Bailey's Encyclopedia of Horticulture. It has no anatomical or morphological variations from the type so it doesn't qualify as a subspecies nor is it a mere form since large and consistent populations occupy the area in which it occurs. In addition to being larger and more robust than the type, the really definitive thing that characterizes it is the red blotch of color in its throat (on the column below the hood) and no red venation or red pigment elsewhere. One can certainly observe ecophenic variations in Sarracenias and color *can* be a result of exposure and season of the year. However, when color consistently and hereditarily shows a definite, delimited pattern which is distinctive as in this case, then I believe the entity under consideration is entitled to nomenclatural recognition as a variety in the technical sense of the word. In the Atlantic coastal plain, one can see in the same interbreeding population of a colony of *S. flava* various color forms involving heavier or lighter red veining or general color. These have no real nomenclatural significance and are simply expressions of genetic segregation although, as Schnell has pointed out, they may be "microecotypic" forms and may in the long run be very important evolutionarily especially if they are responses to the man-made modifications of their habitats. I think many striking forms such as the white-flowered variants of some of the pink-flowered native orchids and the all yellowish-green form of *S. flava* are undoubtedly homozygous for recessive genes where color is concerned and this certainly would explain their occasional occurrence in otherwise typical populations. In my own observations, *S. flava* var. *Rugelii* is the only type of *S. flava* to be found on the Gulf coastal plain but this may not be the true situation. To me, it is the giant of the *S. flavas.*

In regard to *Sarracenia* evolution on the old peneplain surface in eastern North America, I think it should be kept in mind that there was really more topographic diversity then than is sometimes

implied. Although the Appalachians probably exceeded Everest in height at the time of their origin during the Permian 200 million years ago judging by the enormous thickness of the erosion-produced sediments eventually produced, even at their period of maximum erosion some of them in the southeast reared over 2,000 feet above the predominating and nearly sea-level peneplain that surrounded them. There were subsequently two other major uplifts of the mountains that disrupted the old peneplains developed during the intervening erosional cycles. Mt. Davis in Penna. (part of the old original Appalchians which survives till this day) reared over a 1000 feet above the peneplains during the time of maximum erosion but toward the south (and the Gulf of Mexico) the elevations were much higher (2,000 feet) and so there was considerable topographic diversity with river valleys and intervening peaks. This would have provided enough isolation between inbreeding populations of Sarracenias to produce some of the present day species. I would hesitate to call all these populations Sarracenias. Very likely they were a now extinct (through evolutionary modification) and primitive precursor pitcherplant genus that ultimately differentiated into *Sarracenia, Darlingtonia* and *Heliamphora* as they migrated to new regions.

I could ramble on a lot longer on this business of *Sarracenia* evolution much of which involves educated speculation and guessing, but which is, I think, very interesting to consider just the same by those of us who are truly and seriously interested in the minute details of these fascinating plants and their origins. Sometime after I study more about southeastern U.S. and South American geology, I hope I'll be able to consolidate some thoughts on this matter and elaborate on it.

One other interesting thought — since the last glacial period was so recent and some fairly recent studies indicate that the recession of the Pleistocene glaciation from the terminal moraine in the northern U.S. began only 16,000 years ago, the strong indication is that very cold conditions prevailed far to the south in the U.S. Indeed, geological drillings in the Gulf region indicate the presence of cold-water fossil marine faunas (such as certain indicator mollusks) in that region in geologically very recent times. These faunas now exist in the ocean only far toward the north. The indications are clear — the southeastern flora and fauna in the geologically recent past were subjected to far colder conditions than they are today. The fact that they don't occur farther north than they do today is simply because they haven't had the time to migrate very far north yet and edaphic factors hinder this spread, also. For this reason, it isn't too surprising to hear of *Dionaea* and *Sarracenia flava* surviving in Penna. and N. J. and perhaps farther north.

The greatest number of pitcherplant species I have seen in any one given bog was five. In a small bog near Crestview, Fla., I observed *Sarracenia purpurea venosa, S. flava, S. rubra* (Gulf Coast form), *S. psittacina* and *S. leucophylla.* Some hybridization had taken place. I have not been able to find this bog as of recent years because of some road changes but perhaps it is still there. Once, I drove more than 1,000 miles around the periphery of Mobile, Ala. trying to locate all the *Sarracenia* colonies I could. Let me tell you, the suburbs are rapidly eating up these locations and some people who were lucky enough to have beautiful patches of *S. leucophylla* and *S. purpurea* in their own backyards or on vacant lots adjoining their homes told me they just regarded them as weeds!! Beauty, indeed, often is only in the eye of the beholder. The old adage, "Pearls before swine", though unspoken, came to my mind.

I feel that the ranges of the tall, col-

umnar species of *Sarracenia (S. leucophylla, flava,* and *alata)* once were more limited to specific river valleys and that they have been spreading out and extending their ranges laterally to the east and west and extending into each other's territories. Breeding isolation factors for these partially sympatric species are not very good and hybridization incidence is high. Eventually, though certainly not for many human generations, these three species may eventually end up absorbed into a hybrid swarm. It is very interesting along the Gulf Coast to observe traveling eastward first of all only pure colonies of *S. alata,* then *S. leucophylla* appears and hybridizes with it for a short distance to Mobile. Then, east of Mobile, *S. alata* disappears completely and solid, magnificent stands of *S. leucophylla* predominate and then a few *S. flava Rugelii* (the tall, unveined Gulf Coast variant with a blood-red spot only in its throat) appear and hybridize for a distance with the predominating *S. leucophylla.* Finally, *S. leucophylla* dies out and pure stands of *S. flava* replace it. Through the whole area described, *S. purpurea venosa* occurs, usually sparingly, but *S. psittacina,* though inconspicuous, is generally rather abundant.

(Received April 14, 1978)

New Jersey Pine Barrens

by Philip Sheridan
(5729 S. 2nd St., Arlington, VA 22204)

On Tuesday, August 8, my friend Mike Hunt and I met Jim Bockowski at the General Store in Chatsworth for a one day CP expedition in the New Jetsey Pine Barrens. The first place we went was south of Chatsworth and could be approached by two sand roads, one of which was blocked. After driving down a winding sand road in Jim's car we reached a suitable place from which to head into the bog.

After going down a hillside we suddenly saw thousands upon thousands of *Drosera filiformis filiformis.* The *D. filiformis* were growing on a mat of sphagnum moss, which lay on a sand base. The sphagnum mat is right along a tea colored river which is fed by springs percolating through the sphagnum mat. Intermixed with the *D. filiformis* were *Sarracenia purpurea, D. intermedia, D. rotundifolia,* and a species of *Utricularia,* all readily visible. Cedar trees grew thickly on the river bank and a few in the bog resulting in a very picturesque scene, complemented by water lilies and bladderwort flowers. There were so many *D. filiformis,* and for that matter every CP, that one could not help but step on them. In a way this crushing of the droseras may be beneficial in that the broken leaves might bud into more plants. The *D. filiformis* almost glow in the right light conditions, a yellowish-red color being most readily apparent.

This mat of sphagnum continued for some distance up the river and we followed it for quite some time. After searching for awhile we came upon *D.* x *hybrida* which was somewhat difficult to find due to the number of plants in the area. There was only one clump of *D.* x *hybrida* that we found, but I am certain there must be more in this area. As we continued our search of the area we came to a bank about six feet long and two feet wide which was totally covered with *D. rotundifolia,* an amazing sight. Moving along we came to another unusual sight; at the base of a cedar tree a spring had managed to poke its way through and fall about one foot from inside the

tree to a small pool in the base of the tree and then flow out.

Soon we came to a pure stand of possibly fifty *D. rotundifolia* x *D. intermedia* hybrids. These plants were growing on a sandy area fed by a spring and the plants were beautifully red. On each side of these plants were clearly segregated stands of *D. intermedia* and *D. filiformis.* As we continued walking we ran into the white fringed orchid and the distinctively small flowers of *U. subulata.* We found another species of *Utricularia,* possibly *U. cornuta,* with stalks of one foot and large yellow flowers.

Sarracenia purpurea were found all through the area, growing on the drier banks as well as on the sphagnum mats, but clearly flourishing in the sphagnum. I was unable to determine the subspecific designation but it is very likely that both subspecies of *S. purpurea* are found here. Many flower stalks were seen as well as thousands of seedlings. Obviously this bog is in no danger; it is also in a state park.

We proceeded back to Jim's car and on the way discovered a honeybee nest in one of the cedar trees. We were even fortunate enough to observe a hummingbird.

We continued our journey by going on a sand road near Ft. Dix. Right on this sand road were thousands of *D. filiformis,* noticeably smaller than those growing in the sphagnum mat near Chatsworth. To the side of the road we saw sphagnum moss with a few *D. intermedia* but that was all for this area.

The next place we went was along a railroad bed which had been torn up. To the right of this bed was a pond which had just about completely eutrophicated so that only the "eye" remained. The whole area was covered by a mat of very shaky sphagnum moss. Someone had put railroad ties through the bog so we had a convenient area from which to observe the plants. *S. purpurea* was found throughout along with *D. intermedia* and *D. rotundifolia.* This area received full sunshine so the pitcher plants were nicely colored and of good proportions. There was an area of peat near the eye of the bog and *D. intermedia* covered it.

To the left of the railroad bed was a small lake with cedar trees bordering it. Beavers had dammed the area so the shore of the lake had risen, perhaps thus explaining why we saw so many dead cedar trees. *S. purpurea* could clearly be seen across the lake growing in sphagnum moss. We were unable to reach the other side but the plants were of a nice red color and a robust size. We walked back along the railroad bed and came to where a bridge had been. The beavers had made their dam here some time ago and water now flowed over the top. An interesting feature noted at this bridge was the mass of *Utricularia* piled against the dam. I estimate the plants were six inches deep, packed together. The water rapidly flowing over the plants provided a good supply of food to the plants since all the bladders were black with dead prey. The whole area against the dam was filled with *Utricularia* waving gently in the current.

We then went to an area which Jim fondly calls "his bog" and rightly so. It is an excellent example of a cedar swamp. Jim has planted *S. flava, S. rubra, S. minor,* and *Dionaea muscipula* here, all surviving one winter in excellent shape. Walking through the bog among the cedar trees *D. rotundifolia* was growing in the sphagnum moss. *S. purpurea* also grows here, however a difference is noted from those near Chatsworth. Here in the lower light levels and with the sphagnum growing all over the plants the pitchers are noticeably longer and not as brightly colored. Possibly this is the *S. purpurea* var. *stolonifera* Macfarlane talked of. In any case the white fringed orchid was again observed as well as the beautiful yellow bladderwort flowers. A good point to bring up here is how some of these

bladderworts grow. The sphagnum moss tends to be higher near the cedar trees, sloping down gently until a small pool of water is seen. In these pools the bladderworts grow prolifically. The whole cedar swamp is constantly being infiltrated by slightly observable currents of underground water. This results in a constant supply of pure moving water for the bladderworts; also, the water is cool and the area is somewhat shaded. Perhaps this explains why some people have difficulty cultivating native aquatic *Utricularia;* they need a constant flow of cool, pure water.

As I walked further through the swamp I found streams cutting through the moss which, although only two feet wide, were four to five feet deep and moved quite swiftly; these filter through the whole swamp. I decided to collect some moss and began to pick a few handfuls here and there. When I headed back to the road I discovered how heavy a bag of wet sphagnum moss can really be when trudging through a swamp. I tried to carry the bag on my back but this resulted in too much weight with me consequently sinking several feet into the moss. I learned the best way to get a wet bag of moss out was to float it on the water and pull it out; unfortunately, this also resulted in torn bags. I finally made it back to the road and set down my bag of moss. I then explored the other side of the swamp at Mike's and Jim's urging. This side of the swamp had the same character as the other side although slightly more open. I again repeated my sphagnum collecting and was duly rewarded with much hard work.

It was beginning to get dark, so we headed back to Jim's car and went to the place where we had parked Mike's car. We said good-bye to Jim and headed home.

(Received October 31, 1978)

Drosera burmanni
Photo by Joe Mazrimas

The S.E.M.: Seeing a New World

©1978 by Richard M. Adams, II
L. H. Bailey Hortorium, Cornell University
Ithaca, NY 14853

They say to me in their awakening,
"You and the world you live in are but a grain of sand
Upon the infinite shore of an infinite sea."

And in my dream I say to them,
"I am the infinite sea, and all worlds
are but grains of sand upon MY shore."
—Kahlil Gibran (1883-1931)

JUST AS AN APHORISM can bring new insights, the scanning electron microscope can open new perspectives on the microscopic world.

The SEM (as it's abbreviated) magnifies the surface features of specimens. It's a kind of handlens, if you will, but a magnifier extraordinaire! The machine offers substantial improvements over the light microscope in three important areas: magnification, depth of field, and resolution — which means it depicts the microscopic world as it's never before been seen.

Consider a single fleck of sand, picked by happenstance from a shore of countless grains, placed in the SEM, and magnified thousands of times. It is seen as a gigantic boulder, a veritable asteroid from microspace. Zooming in on its every crag and cranny, you cannot help but ponder the infinitude of a world to which we have previously been blind.

Why have we been blind to this realm — or rather, how is it that we can now see it? The answer is that we're seeing it in an unconventional way: not with light, but with electrons.

"Seeing" with Electrons

The first step in electron microscopy is to generate electrons, by running current through a tungsten filament, causing electrons to "boil off." (This is done in a vacuum, as with a light bulb, so the filament won't burn.)

Next, the electrons must be herded toward the object we wish to examine, which is quite a simple feat: electrons are repelled by negative charge, attracted to positive. The filament (*cathode*) has a negative charge and repels the electrons it generates, and the positive pole of the circuit (*anode*) is between the filament and the specimen. Electrons are drawn toward the anode, which is ring-shaped; but the filaments's charged housing funnels them through the hole, so they don't collide with the anode. Instead, they hurtle toward the specimen. The velocity (and hence the wavelength) of the electrons is determined by the difference in charge — the *potential gradient* — between the anode and cathode, and it's adjustable between one and thirty thousand volts.

Now the random herd of electrons must be focused into a precise, narrow

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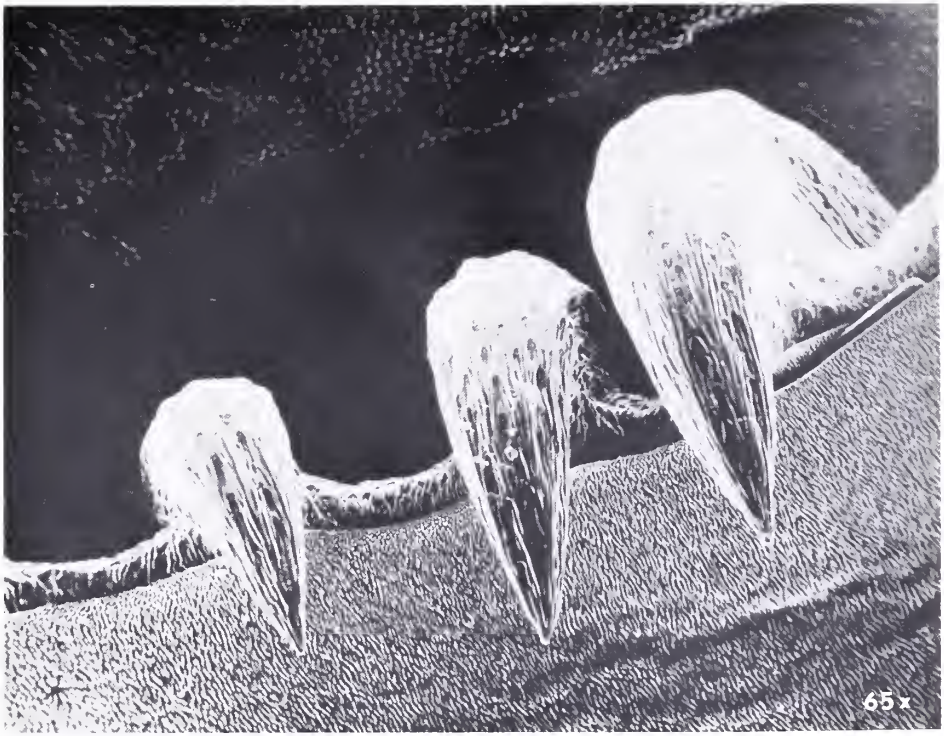
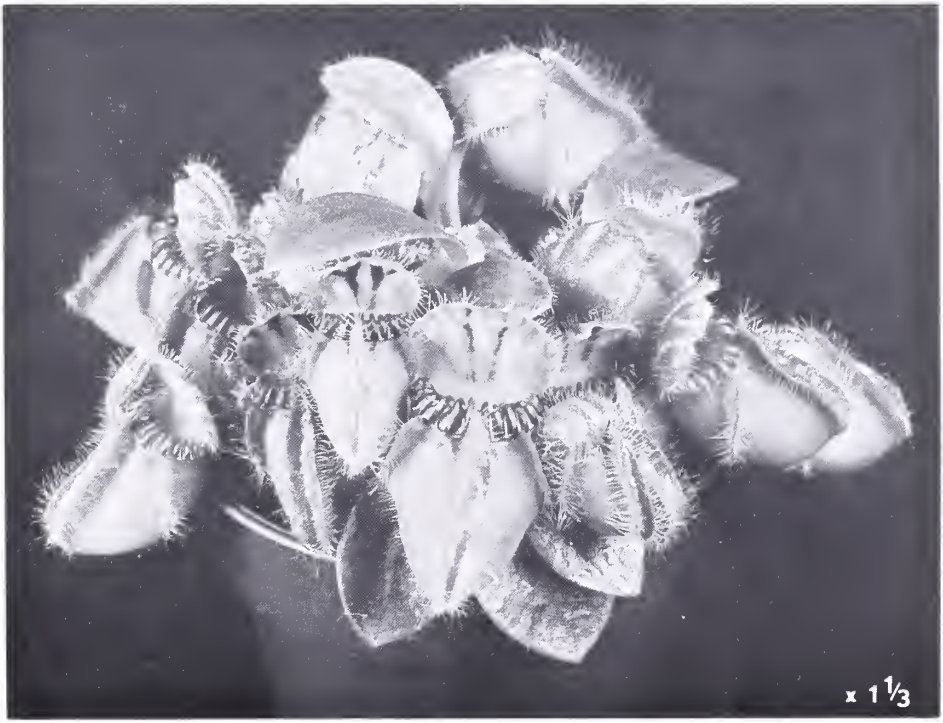
RIGHT

Simplified diagram illustrates SEM's theory. Electrons generated at filament (*top*) are focused into a point on stage (*bottom*). Beam, swayed by scan coils, flies across specimen; the reflected electrons are collected and assembled into a point-by-point display (*right*). [after Everhart and Hayes, 1972]


65x

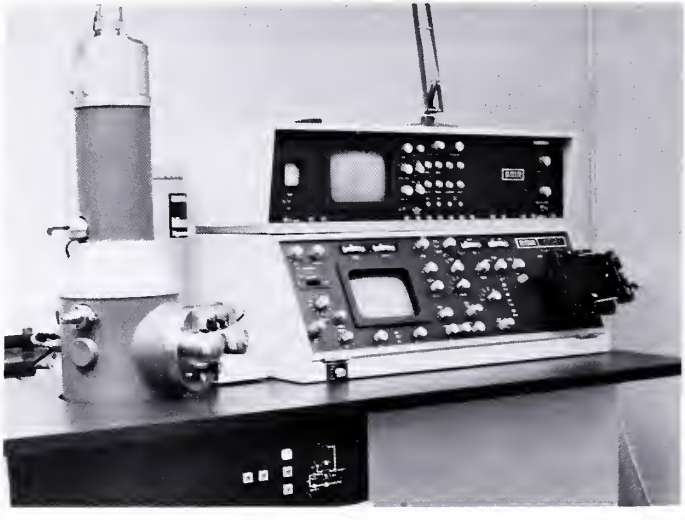

x 1 1/3

beam. Glass lenses cannot be used, as in a light microscope, because electrons won't penetrate glass. But electrons' paths *can* be bent by electromagnetic fields, so electromagnetic lenses are used to focus the electrons.

The electrons which bombarded a specimen are called *primary electrons*. Theoretically, for each primary electron received, the specimen emits a *secondary electron* in exchange. Actually, however, a specimen's surface features affect the number of secondary electrons given off. Valleys and crevices allow few electrons to escape. Peaks and ridges, on the other hand, emit many. And flat surfaces are intermediate. Also, the greater the primary electron beam's incident angle, the more secondary electrons emitted. This is how the SEM depicts topography.

To form an image, the SEM gathers (by means of another potential gradient) the secondary electrons the specimen emits, amplifies them, and displays them as a point on a TV screen. It doesn't focus these secondary electrons into an image, it merely collects them.

How, then, is an image formed? It's built up point by point, as the beam scans over the specimen in a matrix pattern



ABOVE

The machine that took the pictures, one of three SEMs currently in operation at Cornell University. Column at left houses electron beam (see diagram); specimens are inserted through port at base; controls on door manipulate position of stage. Console at right is studded with knobs to adjust electron beam, picture, and magnification. Image is viewed on 3 TV screens (polaroid pictures taken from one at far right). Earlier SEMs cost close to $100,000, but advances in electronics halved this figure for newer ones. Table-top models, ca. $10,000, are also available.

RIGHT

Drosera paleacea flower demonstrates the SEM's lower range of magnification (*clockwise, from upper left*): At 15x, the quarter-inch diameter flower looks like it would in an ordinary photograph except for the fine detail and depth. At 50x, individual cells become visible; note also the four-parted style and anthers shedding pollen. Zooming higher, a ruptured anther locule is seen close-up at 220x, and one of its pollen tetrads fills the screen at 2,560x. Machine can attain 400,000x, but resolution becomes limiting; also, most biological specimens look unimpressive above 20,000x.

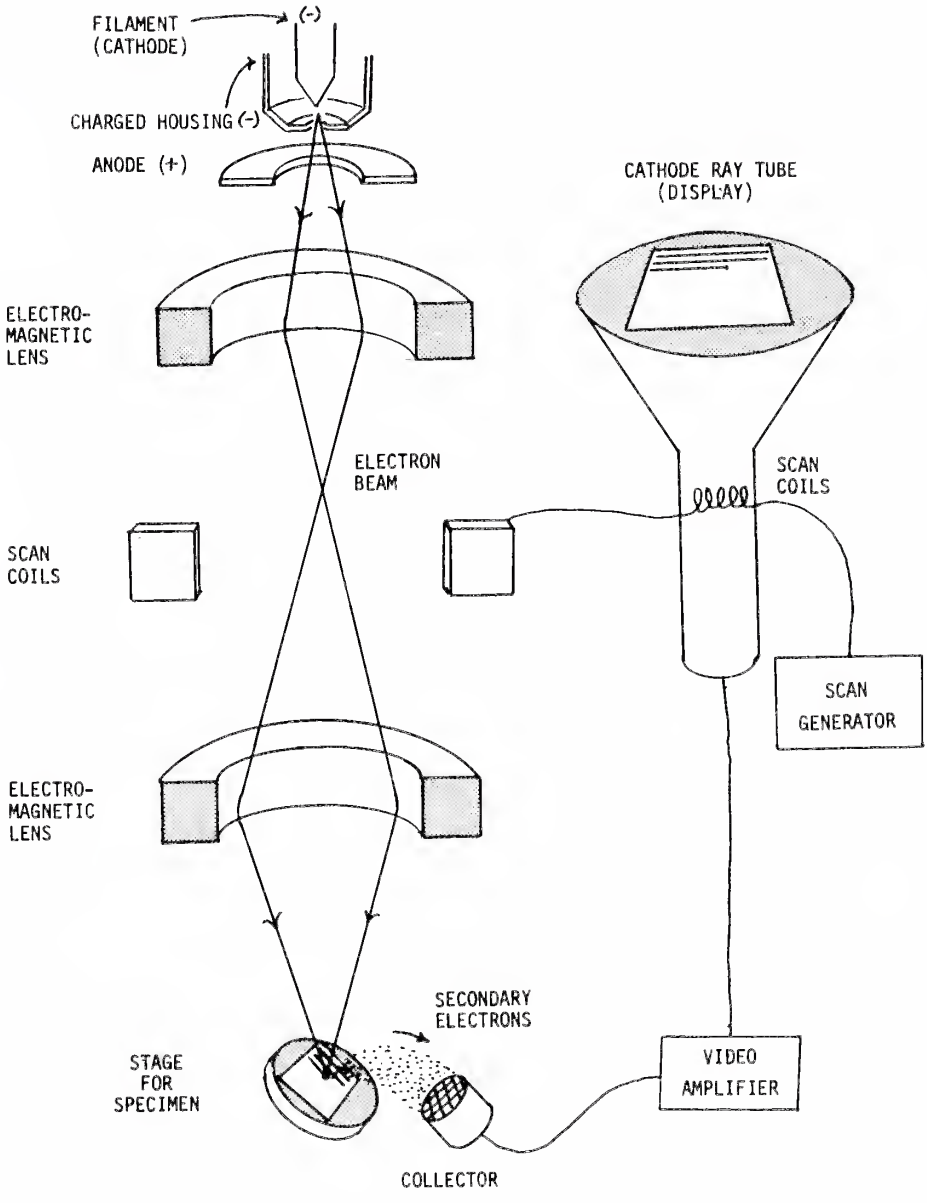

15 x


50 x


2,560 x


220 x

Simplified Diagram of an S.E.M.



(termed a *raster*). A TV set forms its image in the same way: not by focusing from behind the screen, but with a point-by-point assemblage of light and dark points into lines, and of these lines into a plane. Another analogous image is a newspaper photo, which when examined closely, consists of thousands of light and dark spots.

Three Main Attributes

Understanding the SEM's operation allows us to account for its attributes. First of all, it has a very high magnification. The way magnification is increased is by having the electron beam scan a smaller area of the specimen, representing this area on the same-sized TV screen.

Another asset of the SEM is its great depth of field — its ability to depict three-dimensional space. The light microscope's focusing system allows it to bring only a narrow plane into sharp focus. Since the SEM's image is not focused, the limitations imposed by focusing do not affect its depth of field.

The third major asset of the SEM is its resolution, which can be defined loosely as a microscope's ability to bring an object into sharp focus. The wavelength of the radiation used is what limits a microscope's resolution. The resolution of a light microscope is limited by the wavelength of light. At magnifications below about 1,000 times, rays of light can be regarded for practical purposes as moving in a straight line. Beyond 1,000 x, however, its relatively long wavelength limits the ability to focus an object sharply.

Electrons have a much shorter wavelength than light. At magnifications above 1,000 times, they can still be regarded as moving in a straight line, and so do not limit an electron microscope's resolution.

The Aphoristic Perspective

An intimidating array of dials, knobs and switches forms the control panel of the SEM, adding to its science-fiction-like character. The most exciting control is the one marked *magnification.* Merely by turning a knob, it's possible to proceed in steps from a low of 20x, through 50, 100, 50, 1000, all the way up to 100,000 times. Seeing a specimen magnified 60,000 times, we are in a world where an inch, if so magnified, would equal a mile!

Most people come away from their first glimpse of an SEM with a fantastic sense of perspective, and a new appreciation for the microscopic world around us.

Sitting at the SEM and seeing the world as if one inch equalled a mile is really the opposite of jetting along in an airplane and seeing miles go by as if they were inches. Kahlil Gibran's aphorism really puts both feelings into perspective.

FOR FURTHER READING

Everhart, T., and T. Hayes. 1972. The Scanning Electron Microscope. Scientific American 226(1):54-69.

Dwyer, J. 1974. The SEM — Seeing with a New Kind of Eye. Garden Journal of NYBG 24(2):54-59.

(Received August 1, 1978)

LEFT

The SEM's magnification, depth of field, and resolution can impart colossal proportions to Liliputian subjects. Tiny pitchers of *Cephalotus follicularis* (habit photo, *bottom*) appear as menacing "Jaws" of the plant world when rim is viewed from inside (*top*). It's peppered with nectar glands, first seen in this photo. [Taken at the Dudley Observatory, Albany, NY.]

REPRINT POLICY

CPN has received inquiries by some of the authors of papers appearing in CPN regarding the possibility of obtaining reprints. Please contact the printer of CPN, Kandid Litho Company, whose address can be found on the inside front cover.

Hybridization--Where to Now?

by Terry Brokenbro
(37 Laburnham Gardens, Upminster, Essex, U.K.)

Recent decades have seen the introduction of many and varied C.P. hybrids notably amongst *Nepenthes* and *Sarracenia* by many growers. However, while this certainly gives rise to many wonderful and new interesting plants, it is most important that certain standards be met by all hybridists whether it be just one cross or a hundred. Certainly, only vigorous strains should be kept growing from the seedlings and at a later stage, then, the most colorful and pigmented forms of pitcher plant should be retained for propagation. And also, all hybrids should be made with one thought in mind and that is that they remain "true C.P." as much as possible.

For example, some *Sarracenia* species such as *S. psittacina* and *S. purpurea* are not good at catching insects (see S. Clemesha's article in CPN II, No. 4, 57, 1973) and it follows that other species crossed with these could lead to poor insect-trapping plants. However, one hybrid, *S.* x *areolata,* could certainly be interesting to note if particular strains between various forms proved more successful at catching insects than the parents.

Many Sarracenias are now reaching the F-3 stage of hybridization. According to Mendelian laws (1867), the seedlings give rise to 25% the habit of each parent and 50% mixed. Before sowing the seed from such a source, one should take great care that no poor or unsuitable seedlings should survive. Any growers, whether he be amateur, professional, or commercial, should be prepared to destroy any hybrid that does not come up to scratch. Any hybrid which is of doubtful origin should not be used for later crosses.

Much confusion is arising in the *Drosera binata* complex with some plants labeled as *D.* x *binata* or *D.* x *binata* hybrid. Such hybrids could be made between any of the numerous variants and could eventually affect these as distinct botanical forms (although not officially recognized as such). Therefore, any hybridists have a moral duty to keep strict records and advise those to whom they send plants of the correct hybrid name. This is partly what lead to comments in previous CPN issues about the mislabelling of *Nepenthes* hybrids.

Certainly, such hybrids as *D.* x *binata* should be boycotted by true C.P. growers and not recognized amongst them. Such hybrids in the past have caused trouble between Fuchsia and Dahlia growers and much confusion of labeling is not fully sorted out even today.

(Received November 3, 1978)

SPECIAL NOTICE

WANTED: good quality color slides (any size) showing CP growing in an *indoor* situation only, such as under lights, in a window, etc., for a new book that will be published by Rodale Press The *Encyclopedia of Indoor Gardening* will have a chapter on CP, and it is for this purpose slides are being solicited. Plants should be identified and the donor's name should be put on the slide. Slides that are not selected will be returned. Slides that are selected will be returned after publication and a standard commercial fee will be paid. Please send slides as soon as possible (by 01 Jan 1979) to Sue Wymelenberg; 1214 A Hillview Road; Chapel Hill, NC 27514.

British Carnivorous Plant Society

Word has reached us that our British CP enthusiasts have formed THE CARNIVOROUS PLANT SOCIETY as of May, 1978. Membership is open to anyone, including overseas. The group will have meetings and outings with lectures and demonstrations among public and private collections. There will be a journal published at least twice yearly with the first issue this fall (only 1978 issue). The journal will feature Society news, lists of new members, and descriptions of plants along with current cultural and other information. There will be a sales/exchange plant table at each meeting and other arrangements will eventually be made to encourage plant exchange among members. The Chairman and Editor is John Watkins (98 Earls Court Road, London W.8. 6EG, England) and the Secretary is Alistair Mackie (Arnecote Park, Bicester, Oxfordshire OX6 ONT, England). Initial dues for UK are £2.50 and £3.50 overseas. Send dues and membership applications to Alistair Mackie at above address, or send for prospectus from Mr. Mackie also. (Note: overseas applicants should send checks or money orders in their currency for equivalent of above pound sterling rates).

Coming in the March issue:

- Beginner's Corner: *Nepenthes*
- Botanical History of CP III: *Nepenthes*
- A Brief History of *Nepenthes* at Longwood Gardens
- Japanese *Nepenthes* Hybrids
- Thrips and *Nepenthes*

Field Trips for *Pinguicula lusitanicum*

by John Watkins
(98 Earls Court Road, London W.8.6EG, England)

The English county of Devon, well-known for its 18th century smugglers and delicious fresh cream teas, also has *Drosera, Pinguicula* and the odd *Utricularia* growing in its bogs.

Woodbury Common, which is situated between Sidmouth and Exeter, has many bogs and wet heathlands within its boundaries. One bog I have visited a number of times is in a small valley, which is near a quarry and even closer to a disused gravel pit, which, now half full of water, supplies the bog with extra water.

Two years ago this Easter, I visited the bog and found that the water table was seriously down and the bog was drying up! This was because we had had little rain that year. In the spaghnum lined ditch which was at the edge of the bog, I found three fairly large specimens of *Pinguicula lusitanicum* but could not find any more specimens in the surrounding area, which either meant there was a limited distribution or that the majority of plants had been killed off by drought.

This is one of the most beautiful Pinguiculas. It grows to a maximum (in England) of 1 inch in diameter; its grey-green leaves are patterned with thin red veins. The small pink flowers are borne on 1¼ inch stems.

This Easter I visited the same bog and the water level had risen by more than a foot. This meant that the ditch was transformed; nice green sphagnum lined the ditch, and there was a four inch layer of water at the bottom. The flush of extra water had an astonishing effect on the population of *Pinguicula lusitanicum.* They had increased from three plants to about a hundred, which shows that the seed will survive quite long periods of drought.

The seed of this annual *Pinguicula* is easily germinated in a mixture of 2 parts peat, 2 parts small sphagnum, 1 part sand and 1 part loam. I have recently used loam in many of my CP composts with good results. I think it helps to bind the rest of the compost together. The seed should be sown on the compost in a pot of an appropriate size and then put in the deepfreeze for stratification for a couple of weeks, then stand in a tray of water in semi-shade. If the seed is sown in early spring it should germinate in a few weeks and produce its first flower spikes by late May — early June. I have found that this plant usually dies after it has produced about 4-5 flower spikes, leaving plenty of seed for the next season. Although my instructions sound quite simple, this plant is difficult to grow; true success can only be accomplished by experiment.

(Received August 25, 1978)

An Indiana Bog

by James T. Robinson
(Purdue University, Dept. of Horticulture, West Lafayette, IN 47907)

On June 10, 1978 a group of us from the Horticulture Department, Purdue University, visited a bog which is unique in Indiana. The bog is located in the northwestern part of the state, a few miles from Lake Michigan. It occupies a deep ice-block depression surrounded by low morainal ridges, so one must walk downhill through the oak-hickory woods some distance to get to the bog. The bog contains a good sampling of northern flora, including pitcher plants and sundews.

A rough board-walk forms a trail through part of the bog, so access is not difficult. Before entering the bog proper, one crosses a "moat" of open water containing cat-tails and buttonbush. Once in the bog, plenty of live Sphagnum is evident. In some areas, especially along the trail, the moss has decayed to form peat. It is in such areas that *Drosera intermedia* grows in large mats. In the live Sphagnum, there are clumps of *Sarracenia purpurea,* which were blooming nicely while we were there. Also, individual plants of *Drosera rotundifolia* are scattered about.

The bog is quite woodsy with many tamarack, red maple, and some white pine trees. High-bush blueberry, leatherleaf, black chokeberry, poison sumac, and other shrubs form thickets which are almost impenetrable in some spots. While we were at the bog many pink lady's slippers were in bloom. Much like the bogs of farther north, this Indiana bog has open areas where woody species have hardly invaded. There are even some small ponds in the bog.

The bog has been registered as a National Scientific Landmark and will eventually be included as part of the Indiana Dunes National Lakeshore. It is presently owned by an elderly gentleman whose permission must be obtained before entering the bog (he has been known to approach people with a shotgun). The man had originally purchased the land to harvest blueberries, of which there are plenty.

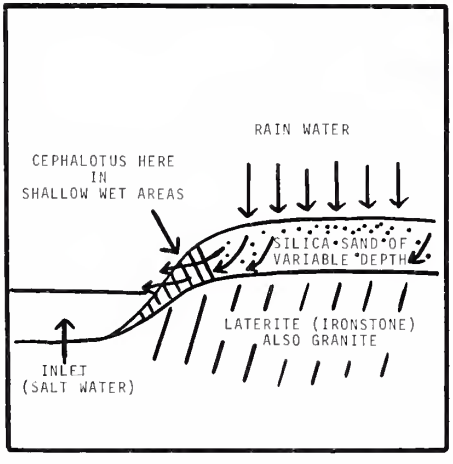
(Received August 25, 1978)

CEPHALOTUS HUNTING IN THE DEEP S.W. OF AUSTRALIA

by Allen Lowrie
(6 Glenn Place, Duncraig, W.A. 6023)

Cephalotus grows only in the lower coastal areas of the South West of Western Australia, from East Albany to Augusta. The area extends inland in relation with the sand plain and is most usually associated with this soil type. I have yet to find this plant growing in loam or clay soils. The swamp flats abound to the coast, broken only by sand dunes and rocky hills at the ocean. In this area water flows and seeps from the Karri forests through rivers, creeks and swamps finishing at inlets to the ocean.

Cephalotus grows mainly in sloping ground where water seeps over layers of mixed sedimentary deposits (consisting of black peat from a few moss species and leaf mould and sand) on laterite zones. This is typical of the coastal plain.



On our trip to the lower South West, Robert Oliver, a fellow CP freak, and myself took a few days off from our Albany hang-gliding/fishing trip to seek out CP in these inlet areas.

The inlet we scouted out was Nornalup National Park (WALPOLE). We followed a swamp right to the inlet's edge, where the inlet's water had eroded back into the swamp land, and had left almost vertical sandcliffs up to 25m high. We clambered down the cliffs to the inlet's shore which was only about 3m wide in places. Parts of the cliff were right in the water. As we stood in the water and looked up at the cliff face, we could see water seeping out of the cliff. The cliff face was only held together here and there with reeds and low vegetation. In amongst the little tufts of reeds *Cephalotus* was in abundance.

Cephalotus follicularis
photo by Robert Folkerts

Cephalotus was growing in full sun right to the top of the cliff face. The plants were up to 20 cm across in clumps and some of the pitchers were 7 cm long, their colour was a deep purple/maroon. These *Cephalotus* clumps were nearly all pitchers with very few leaves. We stood

Two People Bay
Photo by Steve Rose

Cephalotus follicularis
Photo by Steve Rose

Cephalotus: Two People Bay
Photo by Steve Rose

near the water's edge; at chest height in amongst clumps of reeds, *Cephalotus* grew. These shade-growing plants are predominantly green. These thriving plants at the bottom of the cliff face are continually sprayed with salt water, with no apparent effects.

As we continued along the base of the cliffs we could see evidence of the erosion that had taken place on the sand cliff face. The waves have undermined the cliff during storms, where huge clumps of upper cliff (up to 4m across still complete with reeds and *Cephalotus*). The next storm could wash these clumps into the inlet. The erosion, it seems, has been going on since Adam was a boy. No doubt, as one lot of *Cephalotus* is cleared from the cliff face, this bare patch is quickly colonised by *Cephalotus* again. *Cephalotus* seeds washed down through the swamp above the cliff face would soon take their place.

We also found small caves situations that had been created by erosion of the lower cliff face, but before the upper parts of the cliff had fallen. The caves are big enough to stand in and go back into the cliff face about 1½m. *Cephalotus* is growing around the mouth of these caves along with *D. pulchella.* With closer observation we found *D. pulchella* growing up the inside of these sand caves and, strangely enough, growing on the ceilings of the caves in abundance.

About 2km across the other side of this inlet we camped for the night. Here there was a small swamp on a slope about 30° and 3 hectares in size. The swamp had been huge until the locals decided to build a golf course there. The ground in the swamp is mainly knee-deep peat and mud complete with seeping water. The only reason there is still a swamp here was quite evident. When the bulldozer was clearing the land for the golf course, the swampy ground bogged the bulldozer, to the disappointment of the locals.

Along the top of the swamp next to the golf course, *Cephalotus* is everywhere growing in full sun. *D. pulchella* is in abundance, 5cm across with green flat leaves and vivid orange/red traps topped with bright pink flowers. Right in the mushy black peat we found the rare *D. hamiltonii* growing in three's and four's and clumped together. The leaves are deep purple and the plants were 6cm across, all growing in full sunlight, some with old flower spikes 45cm high. *D. hamiltonii,* I believe, is just about as hard to find in W.A. as *D. prolifera* is to find in Queensland.

Robert Oliver and myself decided to venture into this swamp, where the thick scrub was about 1m over our heads. Pushing our way through the scrub with Robert leading, I was packing death with Robert giving me a running commentary up front: "Small tiger snake on right, Allen, another to the left." (This is the year of the snake in W.A.; we have had about 45 snake bite victims so far this year — unfortunately, one death. The unusually long dry spell this year has extended the snake season.)

Amongst the scrub and snakes we found *Cephalotus.* The plants were very green, lots of leaves and very few pitchers. I must conclude that more light influences the production of more pitchers with less leaves, a more robust and better-coloured plant.

Our exploration of Nornalup Inlet was a most rewarding experience, especially finding *D. hamiltonii.* We will visit the area again when the bulbous droseras appear in the next few months. The South West of Western Australia is a gold mine for CP. Two years ago our good friend Steve Rose found several new *Drosera* species during the major flowering period September-November. With this state of affairs in mind the possibility of finding new species with more exploration seems a reasonable assumption.

(Received June 12, 1978)

GENERA INDEX

AUTHOR INDEX

Co-editor Don Schnell — who seems to have undergone some strange transformation in this photo — has been studying carnivorous plants intensively for the past twenty years. A "one of those courses you have to take" botany course in pre med in college inspired him to the extent that botany is practically an avocation competing with a busy medical practice and family for precious time. While all carnivorous plants are of interest to him, his main interests are in systemic and population relationships among the Sarracenias, and lately Utricularias. His large growing collection of diverse species indicates a horticultural interest as well. Don is author of the book, CARNIVOROUS PLANTS OF THE UNITED STATES AND CANADA, several popular magazine articles, three journal papers published, two more in press, and several more on the way. He is also interested in native wildflowers, particularly orchids, and the exotic Ceropegias. Enough of this — Back to the bog for breakfast.

SHORT NOTES TITLE INDEX

BEGINNER'S CORNER INDEX

BOTANIST'S CORNER INDEX

Drosera pulchella, one of the pygmy droseras from Australia, reaches only about 1 inch/2.5 cm in diameter. Cultivated plant grown by Bob Hanrahan.

Photo by B. Hanrahan.